Electronic Supplementary Material (ESI) for Materials Advances.

SUPPORTING INFORMATION FOR:

ROOM-TEMPERATURE APPLICATION OF VO_2 MICROSTRUCTURES ON RIGID AND FLEXIBLE SUBSTRATES BASED ON SYNTHESIS OF CRYSTALLINE VO_2 SOLUTION

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S1. COLLOIDAL SUSPENSION OF VO_2

Fig. S1 shows a photograph of the VO_2 suspension synthesised used the method in Figure 1.

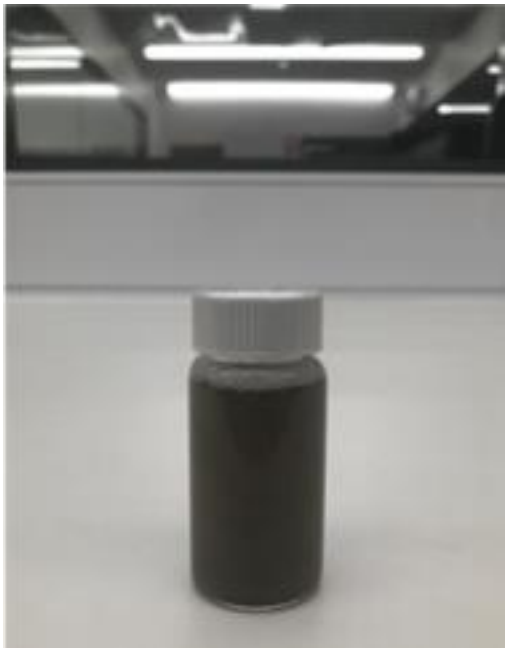


Fig. S1 VO_2 microstructures suspended in IPA synthesised using van der Waals substrates with inert basal planes and hydrophilic surfaces mica shown in this work.

S2. X-RAY PHOTOELECTRON SPECTROSCOPY (XPS) SURVEY SPECTRA

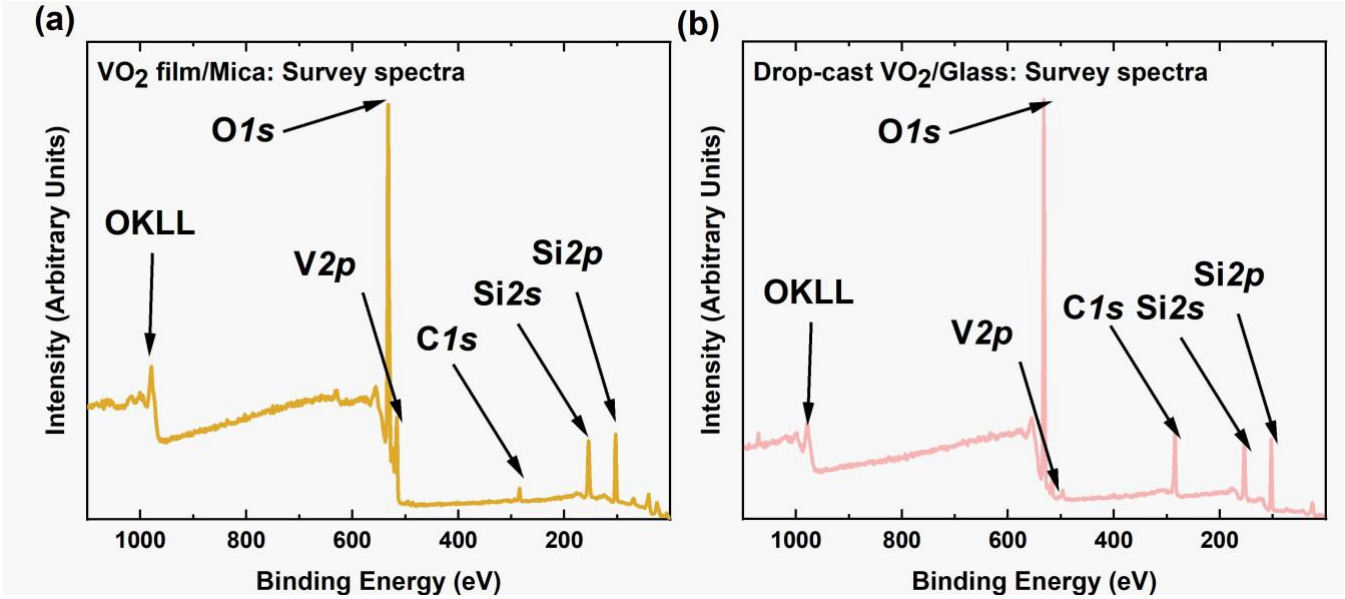


Fig. S2 XPS survey spectra of (a) VO_2 films on mica and (b) drop-cast VO_2 microstructures on glass.

S3. X-RAY DIFFRACTION (XRD) MEASUREMENTS

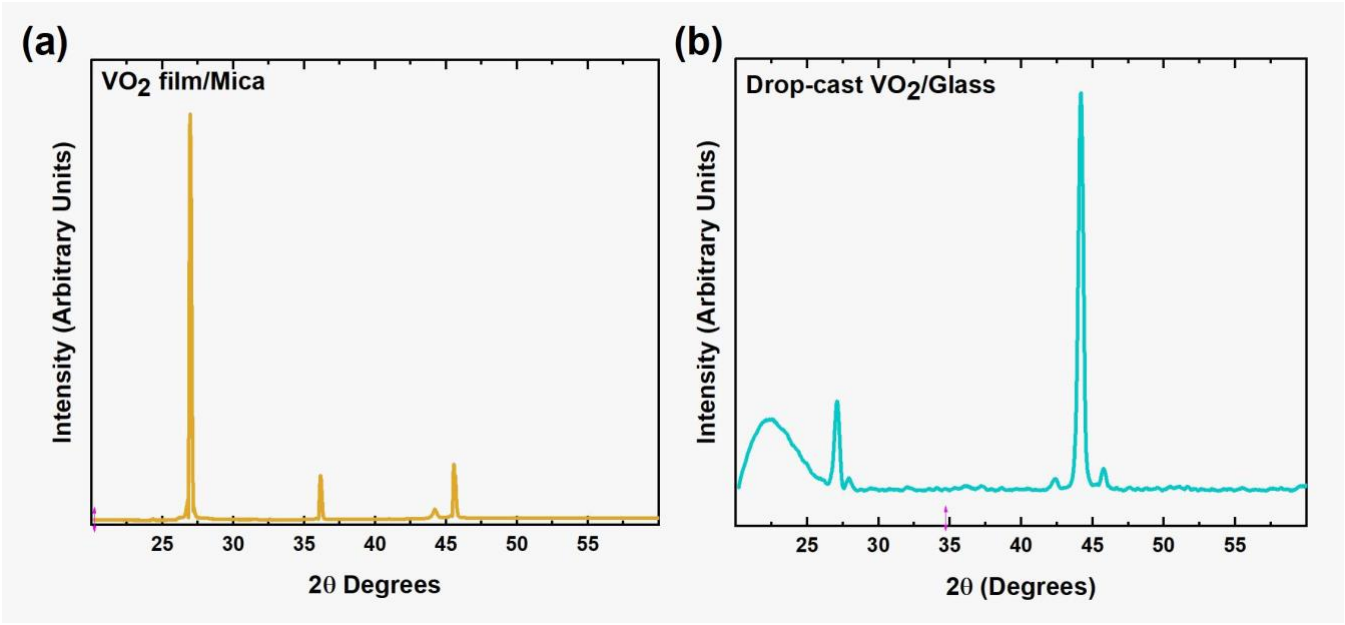
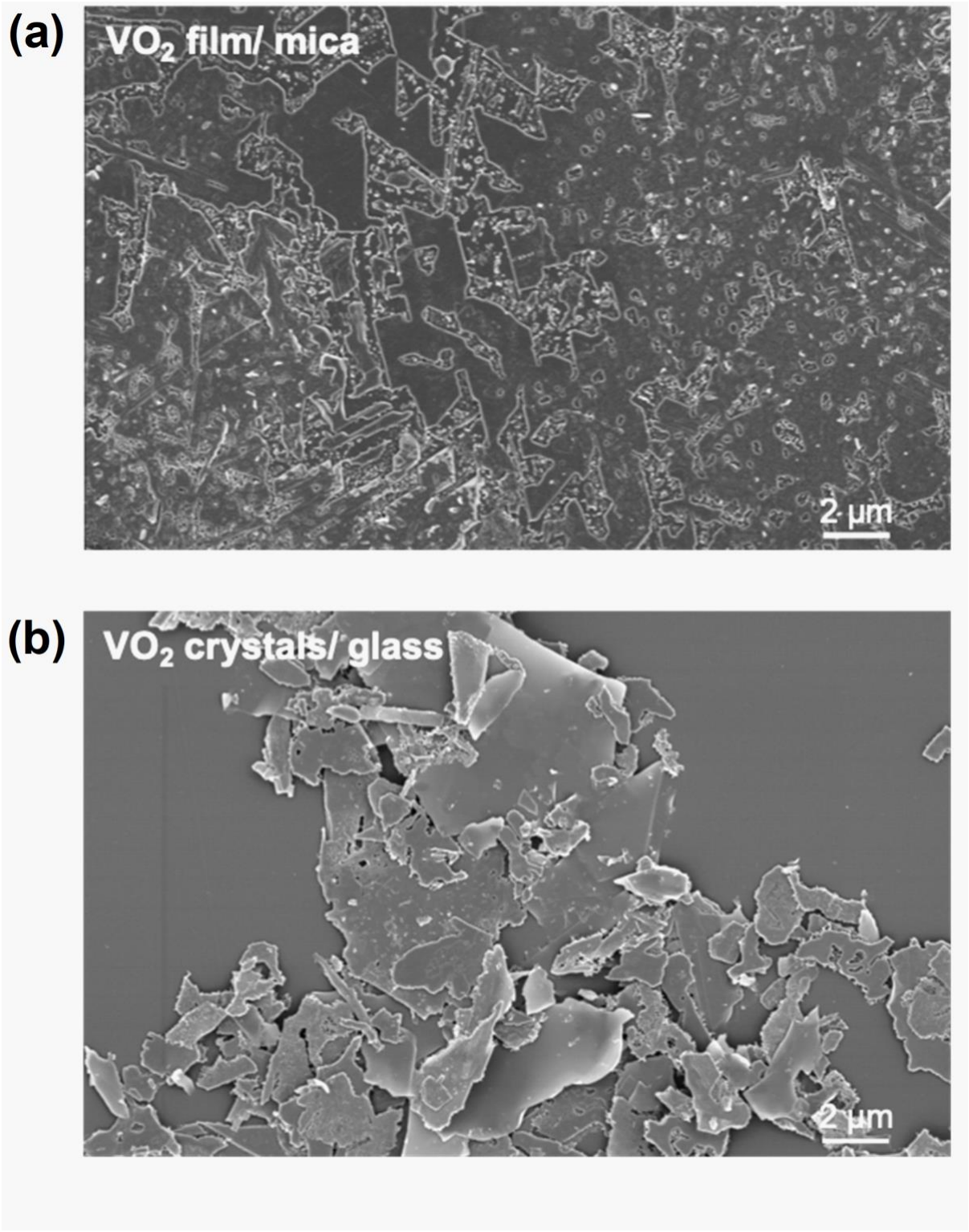
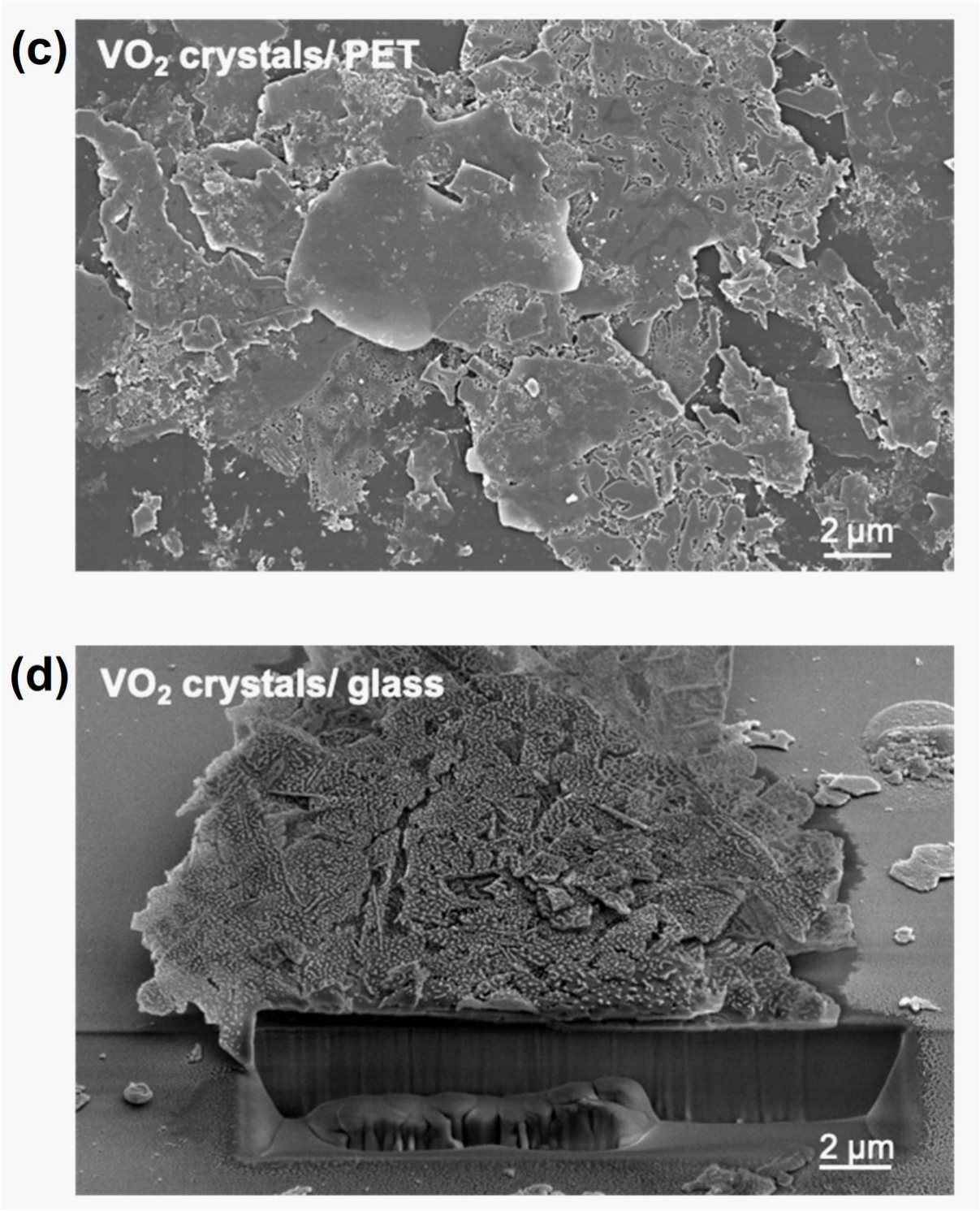


Fig. S3 X-ray diffraction (XRD) measurements for VO_2 microstructures (a) before and (b) after the delamination process.

S4. SCANNING ELECTRON MICROSCOPY (SEM) OF VO_2 STRUCTURES

Fig. S4 shows SEM images of the morphology of the VO_2 thin films before the delamination process used to introduce VO_2 crystals into its solution form. The features on the surface in (d)-(f) are due to solvent droplets leaving residue before the deposition of the conductive 5nm Pt layer used before conducting SEM imaging.




(c)
VO2 crystals/ PET
2 μm
(d)
VO2 crystals/ glass
2 μm

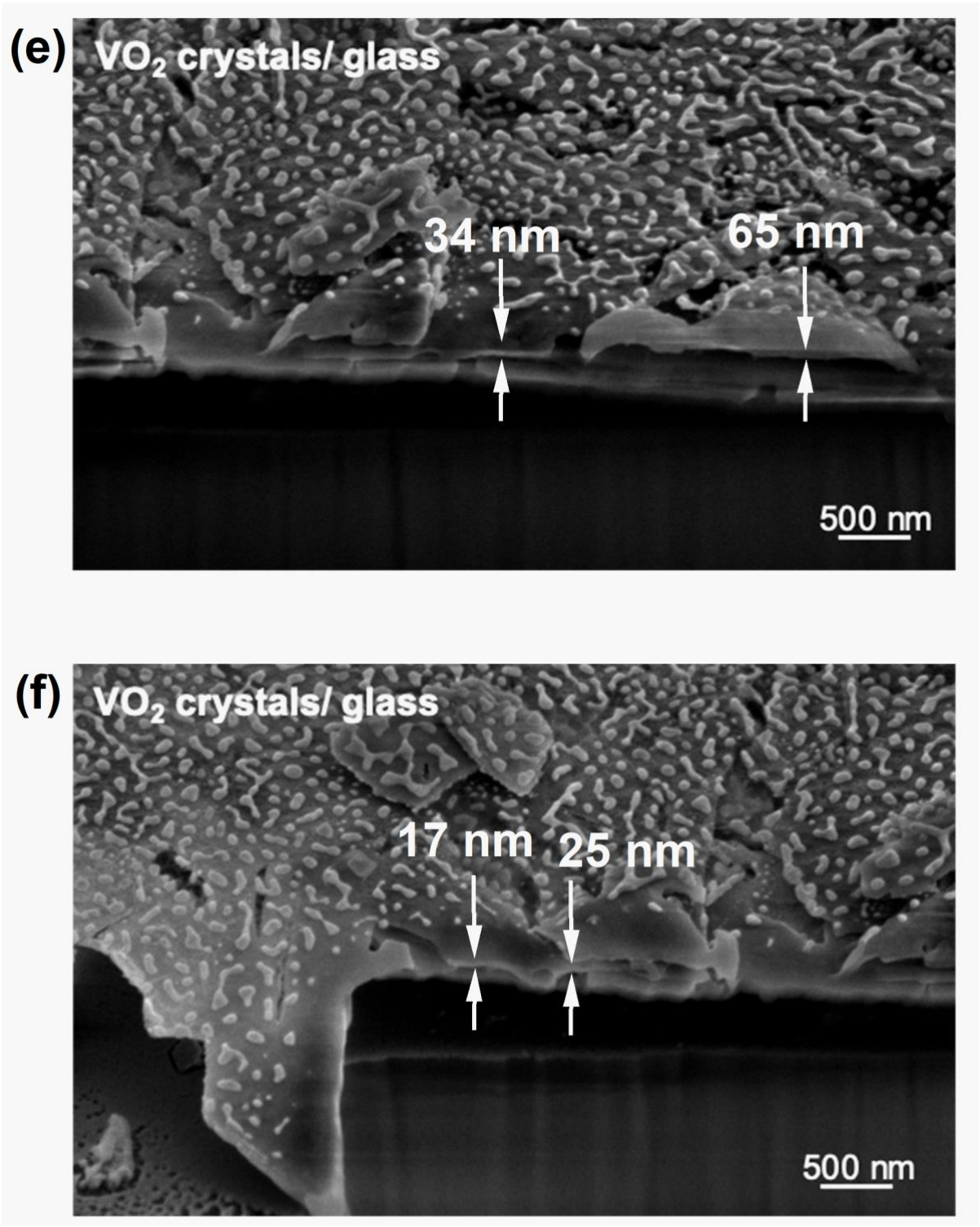


Fig. S4 SEM image (15000X magnification) of (a) VO_2 film on mica. VO_2 microstructures on: (b) glass and (c) PET. (d) Cross section of VO_2 microstructures on glass (5000X magnification). (e-f) High magnification (20000X magnification) SEM image showing multiple overlapping crystals.

S5. *IN-SITU* TRANSMISSION ELECTRON MICROSCOPY (TEM) AND SELECTED AREA ELECTRON DIFFRACTION (SAED)

Video imaging as well as the in-situ collection of TEM and SAED patterns show both the change of morphology and electron diffraction pattern consistent with insulator-to-metal (IMT) behaviour in VO_2 microstructures.

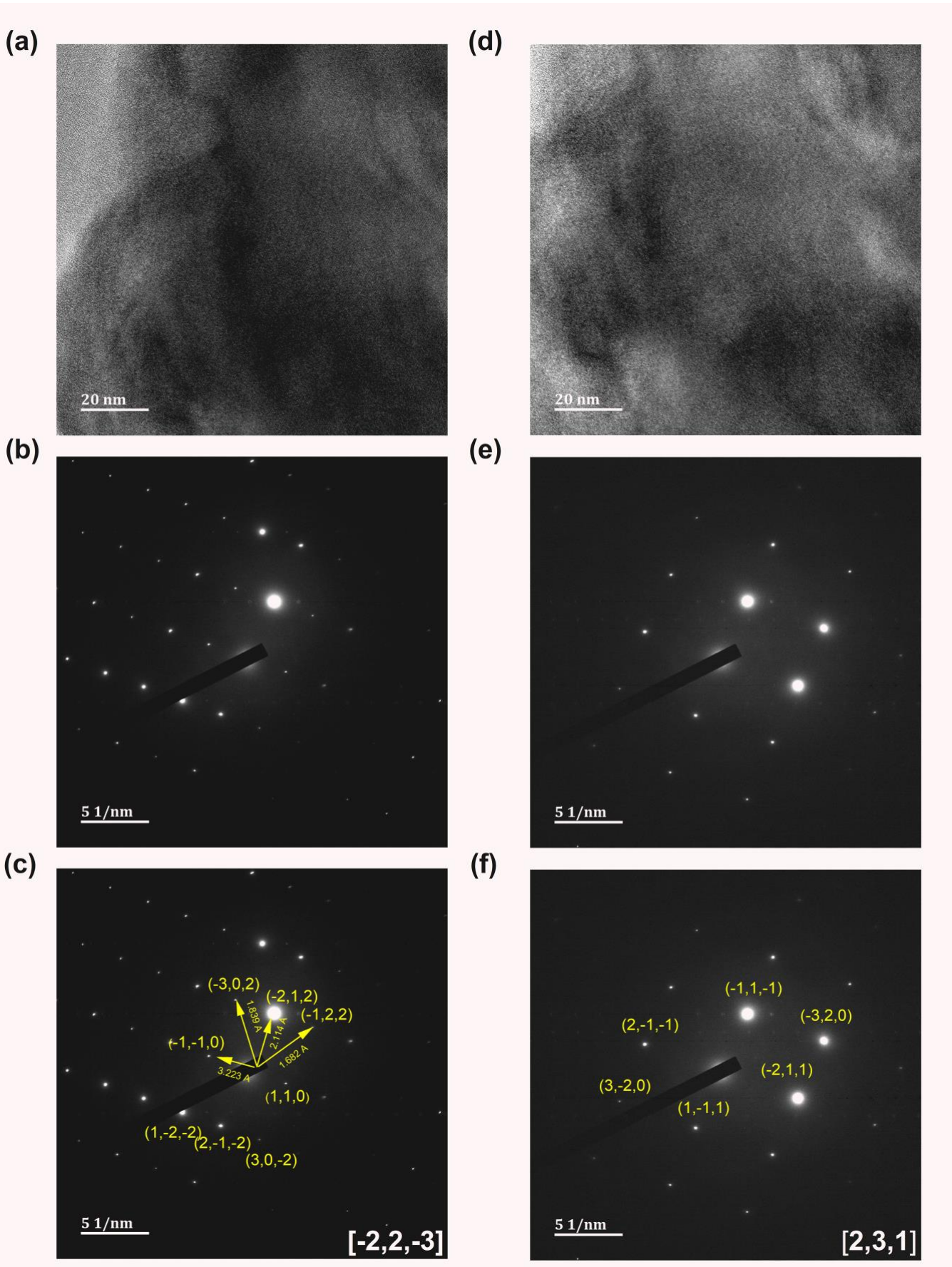

(a)
20 nm
(d)
20 nm
(b)
5 1/nm
(e)
5 1/nm
(c)
(-3,0,2)
(-2,1,2)
(-1,2,2)
(-1,-1,0)
1.839 A
2.114 A
1.682 A
3.223 A
(1,1,0)
(1,-2,-2)
(2,-1,-2)
(3,0,-2)
5 1/nm
[-2,2,-3]
(f)
(-1,1,-1)
(2,-1,-1)
(-3,2,0)
(-2,1,1)
(3,-2,0)
(1,-1,1)
5 1/nm
[2,3,1]

Fig. S5 High-resolution transmission electron microscopy (HRTEM) and selected area electron diffraction (SAED) pattern before and after analysis for monoclinic VO_2 (a), (b) and (c) SAED pattern is indexed based on the JCPDS 76-0456. HRTEM and SAED pattern before and after analysis for tetragonal VO_2 (d), (e) and (f).

Video Image 1. *In-situ* TEM imaging.

Video Image 2. *In-situ* SAED patterns imaging.